

# CCS Roadmap

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## Learning by doing - launching the CCS Commercialisation Programme

April 2012



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## We are:

- **Providing £1 billion direct grant support to a CCS Commercialisation Programme focused on reducing the cost of CCS so that it can be deployed in the 2020s**
- **Using the Programme to identify and address technical, commercial and regulatory barriers to making CCS cost-competitive with other forms of low carbon energy**
- **Committing to share the knowledge from the Programme to accelerate potential cost reductions, ultimately supporting CCS deployment in the UK and globally**
- **Supporting the Government's growth agenda by stimulating investment in CCS creating new business opportunities**

## The issue

- 1.1. Whilst CCS has great potential as a means of generating low carbon electricity, practical experience of putting the technology into practice is limited. Up to now, applying CCS for the purposes of power generation has been limited to the demonstration of partial or full systems on a number of small-scale pilot plants. However, the full CCS chain has already been operated successfully at commercial-scale on a number of industrial processing plants, for example coal gasification or natural gas treatment plants.
- 1.2. Given the limited experience of CCS in power generation, the risks of investing in CCS on a commercial-scale present a barrier to its continued development and commercialisation. These include uncertainty on capital cost, operational performance, the absence of commercial performance guarantees between different parts of the CCS chain, suitable business models and industry's familiarity with the supporting regulatory framework.

## The need for Government intervention

- 1.3. Without Government intervention, the processes that will ultimately drive down the cost of CCS to a level where the risks come within commercial norms are unlikely to enable commercially deployed CCS to contribute to decarbonisation of the UK's power and industrial sectors in the 2020s and beyond. If CCS is to be deployed in the 2020s, final

investment decisions for commercial-scale CCS will need to be made in the early 2020s. For this to happen investors must have confidence that CCS is an attractive option that is cost-competitive with other low carbon technologies.

- 1.4. The Government is therefore taking a number of steps to address this, including major reforms to the electricity market that will improve the investment climate for low carbon generation, and providing direct grant funding through the CCS Commercialisation Programme for the practical application of CCS on utility-scale power generation.
- 1.5. There is a significant amount to be learned about CCS technology, its regulation and the commercial relationships that will deliver successful projects. Sharing, understanding and testing this learning amongst those who are integral to development and deployment of CCS is key to us achieving rapid and efficient progress. Knowledge generated from projects in the UK and elsewhere can be used to reduce risk and accelerate potential cost reductions, ultimately supporting CCS deployment in the UK and globally. The Government intends that any CCS work it supports will be at the forefront of this process of international dissemination.
- 1.6. The following sections focus on our activities to date for developing commercial-scale CCS and the CCS Commercialisation Programme.

## Meeting the need

- 2.1. The Government is taking a number of actions that are supporting the advancement of CCS and these are summarised in the Roadmap. At the centre of these is the CCS Commercialisation Programme. The Programme is the largest of its kind anywhere in the world and provides a route for Industry to secure the financial support needed to advance CCS to the next stage of its development and towards eventual commercialisation.
- 2.2. The Programme will support commercial-scale CCS projects and has been designed to support an Industry led approach to the development and delivery of CCS projects, within an environment of risk sharing between government and industry.
- 2.3. The Outcome that the CCS Commercialisation Programme seeks to deliver, is that:  
  
*'As a result of the intervention, private sector electricity companies can take investment decisions to build CCS equipped fossil-fuel power stations, in the early 2020s, without Government capital subsidy, at an agreed CfD Strike Price that is competitive with the strike prices for other low carbon generation technologies'.*
- 2.4. The Programme's outcome based approach puts the onus on industry to bring forward CCS solutions. This includes encouraging innovative solutions that utilise part-chain, full-chain and the clustering of projects, including industrial emitters. The Programme has consequently been designed to be broad in scope and flexible, so as to be receptive to the different approaches that may come forward. This might include, for example, activities that:

- Demonstrate full-chain CCS;

- Develop infrastructure, including that which might be available to subsequent projects;
- Include emissions from sources other than power stations;
- Develop parts of the CCS chain (providing there is a clear view of how such activities will subsequently become part of full-chain projects); and
- Investigate alternative options, including storage combined with enhanced hydrocarbon recovery.

2.5. Figure 1 is illustrative of how a future CCS network might develop over time as a result of the initial stimulus provided by the Programme.

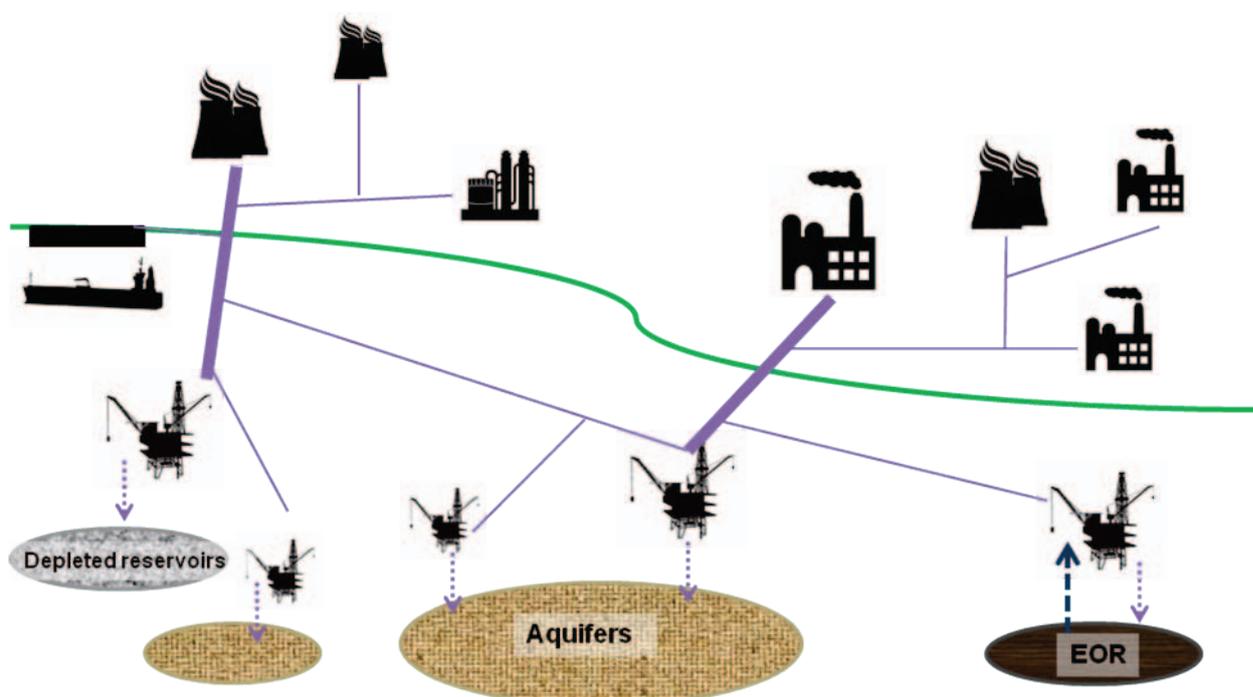


Figure 1.

## The CCS Commercialisation Programme

### Overview

- 3.1. The CCS Commercialisation Programme makes available £1 billion in grant direct funding with projects also able to earn revenue from the sale of electricity in a reformed electricity market designed to stimulate investment in low carbon electricity.
- 3.2. The aim of the Programme is to drive down the costs of CCS to a level where it is able to compete with other low carbon technologies. The construction and extended operation of commercial-scale CCS under the programme will significantly reduce the remaining technology risks, test and build familiarity with the CCS specific regulatory framework, encourage industry to develop suitable CCS business models, kick start the supply

sector, and contribute to the development of local infrastructure for CO<sub>2</sub> transport and storage.

- 3.3. This targeted support will allow industry to gain practical experience in the design, construction and operation of CCS at commercial-scale, helping to bring the investment risks of CCS projects within commercial norms, lowering costs (currently subject to a risk premium) and making commercial investment decisions possible.

### Programme scope

- 3.4. The wide scope of the Programme necessitates the outcome based approach that has been adopted and our belief that the market is best placed to identify and bring forward solutions that together will deliver the Outcome. We wish to minimise constraints placed on the market in identifying a route to commercialisation of CCS and are inviting industry to put forward a range of proposals, not limited to full-chain proposals. The Programme is therefore open to part-chain CCS projects to ensure that we are able to capture the potential benefits of projects that plan to share infrastructure, creating clusters of capture facilities sharing transport and storage infrastructure. We are also open to making support available for earlier development work, such as studies to assess the impact of adding industrial emitters to clusters or competitive Front End Engineering Designs (FEEDs) for a number of future commercial-scale projects.
- 3.5. As a result of the Programme we might expect to see the foundation of a pipeline network in regions of the UK with high levels of emissions, together with more than one storage option in the North Sea that may be available for future projects. The provision of early offshore transport and storage infrastructure could provide an embryonic transport and storage infrastructure sowing the seeds for a future CO<sub>2</sub> network.
- 3.6. We will favour those projects that contribute the most to delivery of the Commercialisation Programme Outcome, offer good value and are affordable. Projects that offer future scope to link multiple emitters through shared infrastructure will as a result offer reductions in risk and cost to those emitters that wish to utilise the infrastructure, and therefore enable them to make commercial decisions regarding the technology.
- 3.7. Disseminating the learning from projects to enable others to capitalise upon it is central to our Programme, so we will favour projects offering strong and proactive knowledge transfer provisions. Sharing knowledge will enable specialists, academics, and industry organisations to develop and improve on technologies and processes, speeding up the development of CCS solutions and enabling novel and innovative approaches.
- 3.8. As with any programme of major Government expenditure, we intend that the Programme, as well as delivering the Outcome, will support or compliment our wider policies, including encouraging growth and the deployment of CCS around the world.
- 3.9. The eligibility criteria for the programme are shown below.

### Eligibility criteria

In order to deliver our Outcome, we have set the following eligibility criteria for entry into the competition. The eligibility criteria include that projects:

- May be full-chain or part-chain that can demonstrate the prospect of being part of a full-chain project in the future;
- Comprise a power plant and capture facility located in Great Britain and a storage site offshore;
- Must be able to be operational by 2016 - 2020, though earlier is desirable;
- Must abate CO<sub>2</sub> at commercial-scale (or be a substantive step towards that objective) whilst meeting all relevant environmental requirements; and
- May contain an electricity generator or an industrial emitter which is part of a cluster project.

Further, in order to participate developers must have relevant expertise and experience of managing complex projects in this or a closely associated field, and the backing of at least one parent company with a significant balance sheet. Full details of the eligibility criteria are set out in the bid documentation, which registered bidders can access in the first month of the competition once signed Competition Process Agreements are returned.

### Funding under the CCS Commercialisation Programme

3.10. Given that projects under the Programme will be “first of a kind”, we can expect some uncertainties that may not be considered business as usual risks. Therefore, our approach is to provide the additional support needed to get projects off the ground, whilst leaving sufficient market incentives to drive performance and value. We will do this through a combination of direct capital grants and projects being able to earn revenue from the sale of clean electricity in a reformed electricity market. The European Commission’s NER 300 Programme has also made available funding that will compliment that provided under the Programme.

3.11. Through this approach we expect to:

- Bring CCS projects within the wider market framework, providing both short and long-term certainty for investors and wider stakeholders;
- Allow CCS investors and Government to gain early experience of operating CCS plant within the wider electricity market prior to wide-scale deployment in the 2020s;
- Minimise the level of direct public expenditure needed to fund the CCS programme; and

- Provide a consistent and coherent framework for the future retrofit of unabated capacity (including on CCS projects) and provide a clear line of sight for the transition to wide-scale CCS deployment.

### European Commission's New Entrant Reserve funding scheme

The New Entrants Reserve (NER) is a European funding programme for CCS and innovative renewable technology demonstration projects. It is being funded from the auction of 300 million EU ETS allowances – 200 million in 2011/2012 and 100 million at an unspecified future date.

In the first phase (funded from the sale of the 200 million allowances) the NER is intended to support up to 8 CCS and 34 renewable technology proposals. If there is not sufficient funding to support this many proposals, the amount of funding for CCS and renewable technology will be reduced in proportion to the total funding applied for in those categories.

The UK submitted seven UK CCS applications for consideration under the NER process, though one (Longannet) was later withdrawn following our decision not to proceed with that project.

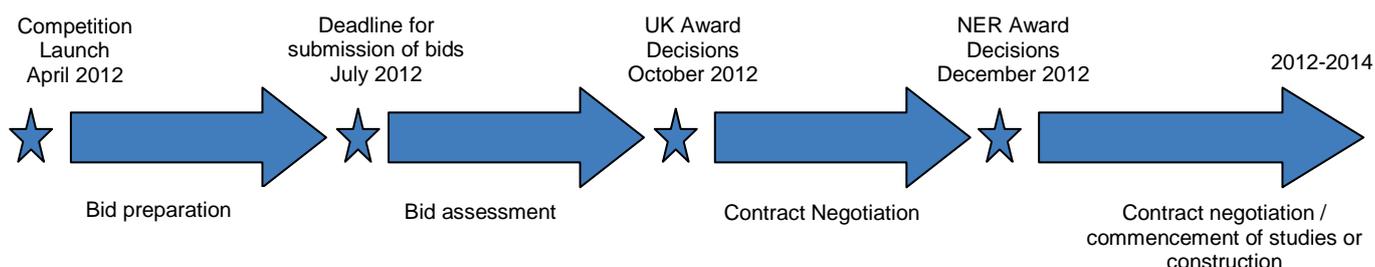
The NER will support a maximum of three projects in any Member State. However, the low carbon prices that we have seen in the last few months mean that the total amount of NER funding is likely to be lower than had originally been anticipated, and the total number of CCS projects that will be supported is likely to be small.

The NER process is as follows:

- Project Sponsors submitted applications to the Member State in which their project will be based on 9 February 2011);
- Member States assessed the applications against the EU NER criteria and put forward those that meet the criteria and that they are willing to support to the European Investment Bank (EIB) on 9 May 2011;
- The EIB carried out a financial and technical due diligence of the submitted applications, and reported its findings to the European Commission on 9 February 2012;
- The European Commission will now assess those projects that passed the EIB's due diligence against the eligibility criteria, seeking to balance lowest cost projects and geographical spread. It will also seek confirmation from Member States of their support for shortlisted projects; and
- The European Commission will make the final decision on which projects to support in the second half of 2012.

## Next Steps and indicative timetable

3.12. The CCS Commercialisation Programme Competition was launched on 3<sup>rd</sup> April 2012 and an indicative timeline for the Competition is shown below. Full details of the Competition together with regular progress updates can be found on the OCCS Competition pages at [www.decc.gov.uk/occs](http://www.decc.gov.uk/occs).



**Figure 2. CCS Commercialisation Programme Timeline**

## Creating and sharing knowledge

- 4.1. Up to now Government supported CCS activity under the first demonstrator has got us to the point where we know that cost-competitive CCS is feasible and we now have a good understanding of the construction and operational risks in specific circumstances, much of which can be generalised. That information has been made freely and widely available. We will continue this policy for activities that are supported in the future.
- 4.2. Sharing of knowledge from the UK's CCS activities and learning from projects in other countries is essential if we are to speed up the development and deployment of CCS both in the UK and globally. The learning generated from the Front End Engineering Design (FEED) studies funded under the competition for the first demonstrator has been widely disseminated.
- 4.3. Full details of the FEED material can be found on the DECC website at: [http://www.decc.gov.uk/en/content/cms/emissions/ccs/demo\\_prog/feed/feed.aspx](http://www.decc.gov.uk/en/content/cms/emissions/ccs/demo_prog/feed/feed.aspx).

### Knowledge Transfer from the E.ON FEED study

The E.On CCS Project at Kingsnorth consisted of a 300MW (net) post combustion carbon capture plant integrated with new supercritical coal fired power station, and associated dehydration and compression facilities, a new predominantly offshore vapour phase pipeline for CO<sub>2</sub> transportation to the pressure depleted Hewett gas field in the southern North Sea with a new platform and wells and multiple previous well penetrations.

E.On withdrew from the first CCS project in October 2010 but were supported to conclude work already in hand to generate valuable CCS knowledge.

The study has yielded knowledge on areas including project design, technical design around capture and compressions, pipelines and platforms and wells and storage, health and safety, environment, consents and project management.

### Knowledge Transfer from the Scottish Power FEED study

The ScottishPower Consortium CCS Project at Longannet consisted of a 300MW (net) post combustion carbon capture plant (independently supplied with power and heat) capturing from an existing sub-critical coal fired power station, with associated dehydration and compression facilities, a converted natural gas transmission line onshore (in vapour phase), further compression for dense phase transportation through a converted subsea gas export line to the aquifer supported Goldeneye gas field, re-using an platform with new injection facilities and re-completed wells.

The decision not to go ahead with the CCS Longannet project was announced in October 2011.

The study has yielded knowledge in areas such as cost, design, end-to-end CCS chain operation, health and safety, environment, consent and permitting, risk management, and FEED management for a full chain.

## Maximising UK economic benefits

- 5.1. The CCS Commercialisation Programme, and the major reforms being made to the electricity market, represent a significant investment in CCS over a sustained period, so it is vitally important that we capitalise on it, maximising the benefits for UK plc. The Government is committed to raising awareness across business of the opportunity that the Programme represents for business, both in the short-term and in the medium to longer-term. .
- 5.2. The Programme will provide an opportunity for businesses to capture the benefits of being a first mover in the development of commercial-scale CCS. In the short-term there will be

the opportunity to provide goods and services to projects that come forward under the programme, stimulating a CCS supply chain for capture equipment and transport and storage infrastructure and related services.

- 5.3. This early experience will help providers to develop knowledge and capability that can be built upon and exploited at home and elsewhere across a growing CCS market over the coming decades, creating new business opportunities in the UK.

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